

SPECIES OF *MICROMUS* (NEUROPTERA: HEMEROBIIDAE) IN NEW ZEALAND

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Abstract. The endemic New Zealand species *Micromus bifasciatus* Tillyard, 1923 is compared with *Micromus tasmaniae* (Walker, 1860) a species common in both Australia and New Zealand. Three syntypes from Tasmania, Australia, are designated as lectotype and paralectotypes of *Hemerobius tasmaniae* Walker, 1860. Redescriptions of specimens known as 'varieties' suggest they could be hybrids of the two species.

Of the five species of Hemerobiidae recorded in New Zealand (Wise 1991), the only endemic is *Micromus bifasciatus* Tillyard, 1923 (Fig. 1). This species is examined and compared with *Micromus tasmaniae* (Walker, 1860) (Fig. 2) which is the common lacewing in both Australia and New Zealand. Named varieties of the former are considered as variations only but those of the latter are described and discussed separately.

Tillyard (1923) described *Micromus bifasciatus* from southern South Island specimens first collected in 1905, with two varieties *amabilis* and *imperfectus*, from North I specimens. Hudson (1950) recorded the species *M. bifasciatus* and suggested that Tillyard's var. *amabilis*, with pink-veined wings, is the normal form. Hudson's colour figure is of this form but it somewhat over-emphasizes the pink coloration in the wings. He also noted that he took the first known specimen in 1904. *Micromus bifasciatus* has been progressively recorded by Wise (1963, 1973, 1977, 1983, 1988, 1991) while Monserrat (1990b) listed the species and the two varieties. Wise (1991) extended the distribution of the species to Stewart I.

The widespread *Micromus tasmaniae* (Walker, 1860) has been recorded in New Zealand, first by McLachlan (1869) and many times since. Broun (1898) recorded *Chrysopa* as being common but that genus (and the Family Chrysopidae) was not then known in this country and the reference is probably to this species. Alfken (1904) recorded *M. tasmaniae* on Chatham Is, and it was recorded by Wise (1971) on Auckland Is and Antipodes Is, Wise (1972) on Kermadec Is, Roberts (1979) on Cavalli Is and Wise (1983, 1985) on Poor Knights Is and other off-shore islands.

Tillyard (1923) gave a brief description of the wings of *M. tasmaniae* and described two varieties, *manapouriensis* and *nigroscripatus*. Previously, the wings of this species had been described by Tillyard (1916) as being variable in colour and, later, the species was re-described by New (1988), but there is no mention by either author of colour varieties appearing amongst Australian specimens. Hudson (1950) discussed the species and gave a colour figure which can be compared with his figure of *M. bifasciatus*. *Micromus tasmaniae* has been listed for New Zealand by McLachlan (1869, 1873, 1874), Hutton (1874, 1899, 1904), Hudson (1904), and Wise (1963, 1973, 1977, 1991). Monserrat (1990a) mentioned the species and also listed it (1990b) together with the two Tillyard varieties.



Fig. 1. *Micromus bifasciatus* Tillyard, 1923. Female. (Photo: K. Pfeiffer).



Fig. 2. *Micromus tasmaniae* (Walker, 1860). Female. (Appearance of dark median lines in cells is an artefact). (Photo: K. Pfeiffer).

In the synonymic lists for each species below, references for the New Zealand sub-region are given; the three main islands and close off-shore islands are indicated as “NZ”, the outlying island groups are named. In the Australian sub-region, the southern island of Tasmania was first named “Van Diemens Land” and continental Australia was first named “New Holland”, which names both appear in early insect records. After the first reference to each, below, Tasmania is included with other Australian records as “Aust”. Records beyond Australasia are not included here as they have already been listed (Wise 1991).

Specimens are in the collections of Auckland Institute and Museum (AMNZ); The Natural History Museum, previously British Museum (Natural History), London, England (BMNH); Canterbury Museum, Christchurch (CMNZ); Lincoln University, previously Lincoln College, Entomology Department, Canterbury (LCNZ); Museum of New Zealand, previously National Museum of New Zealand, Wellington (NMNZ); and Landcare Research, Auckland (NZAC).

G.V Hudson labels are tiny number/letter labels and the specimen data given in brackets is from the G.V. Hudson collection register in NMNZ; data from other labels (where present) follows. Records of missing Hudson specimens are included in case they can now be recognised in other collections.

Genus **Micromus** Rambur, 1842

- Micromus* Rambur, 1842, Histoire naturelle insectes Névroptères, 416.
Nesomicromus Perkins, 1899, Fauna Hawaiiensis Ed.2(2): 37.
Eumicromus Nakahara, 1915, Annotat. Zool. Japon 9: 36.
Austromicromus Nakahara, 1960, Mushi 34: 35.
Micromus Tjeder, 1961, South African Animal Life 8: 305.

Micromus bifasciatus Tillyard, 1923

(Figs. 1, 3, 5, 7-17, 29)

- Micromus bifasciatus* Tillyard, 1923, Trans. N.Z. Inst. 54: 221 (NZ).
Micromus bifasciatus var. *amabilis* Tillyard, 1923, Trans. N.Z. Inst. 54: 222 (NZ).
Micromus bifasciatus var. *imperfectus* Tillyard, 1923, Trans. N.Z. Inst. 54: 223 (NZ).
Micromus bifasciatus : Hudson, 1950, Fragments N.Z. Ent., 117(NZ).
Micromus bifasciatus var. *amabilis* : Hudson, 1950, Fragments N.Z. Ent., 117 (NZ).
Micromus bifasciatus : Wise, 1963, Pacific Insects 5(1): 55 (NZ).
Micromus bifasciatus : Wise, 1973, N.Z. Ent. 5(2): 184 (NZ).
Micromus bifasciatus : Wise, 1977, Bull. Auckland Inst. Mus. 11:132 (NZ).
Micromus bifasciatus : Wise, 1983, Rec. Auckland Inst. Mus. 20: 255 (NZ).
Micromus bifasciatus : Wise, 1988, Rec. Auckland Inst. Mus. 25: 183 (NZ).
Micromus bifasciatus : Monserrat, 1990, In Advances in Neuropterology, 227 (NZ).
Micromus bifasciatus var. *amabilis* : Monserrat, 1990, In Advances in Neuropterology, 227 (NZ).
Micromus bifasciatus var. *imperfectus* : Monserrat, 1990, In Advances in Neuropterology, 227 (NZ).
Micromus bifasciatus : Wise, 1991, Rec. Auckland Inst. Mus. 28: 212, 214 (NZ).



Figs. 3, 4. *Micromus* spp. Head and prothorax, dorsal. 3. *M. bifasciatus*. 4. *M. tasmaniae*. (Del. P. Quinn).

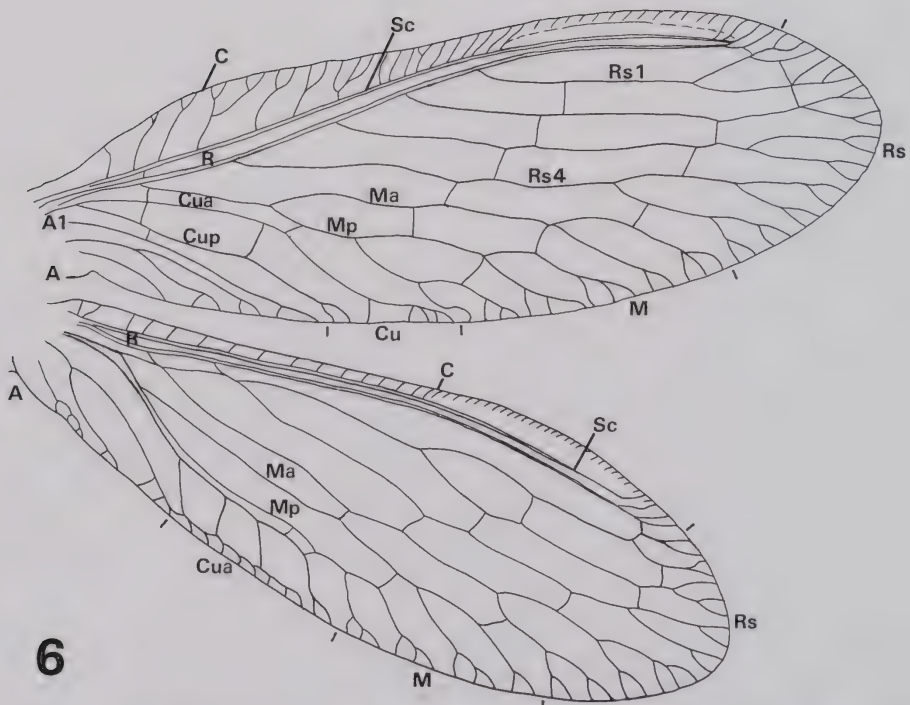
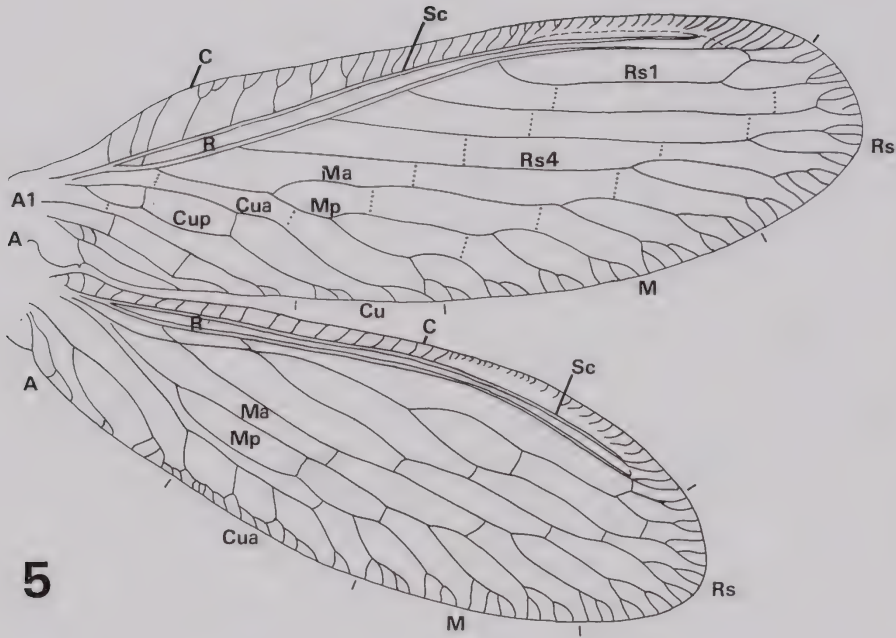
Small, brown species, some specimens very dark, almost black. Wings mainly clear, main veins often pink; anterior wings with two dark brown transverse bands, an obvious dark brown elongate streak between two close veins towards base, various light to dark patches around wing margin; posterior wings with some dark veins and cross-veins in apical and posterior areas.

Antennae. Almost unicolorous, light brown, sometimes slightly darker towards apex; scape large, basal flagellar segment larger than remainder. Males, scape plus 58-64 flagellar segments; females, scape plus 58(54,56?)-66(67?) flagellar segments.

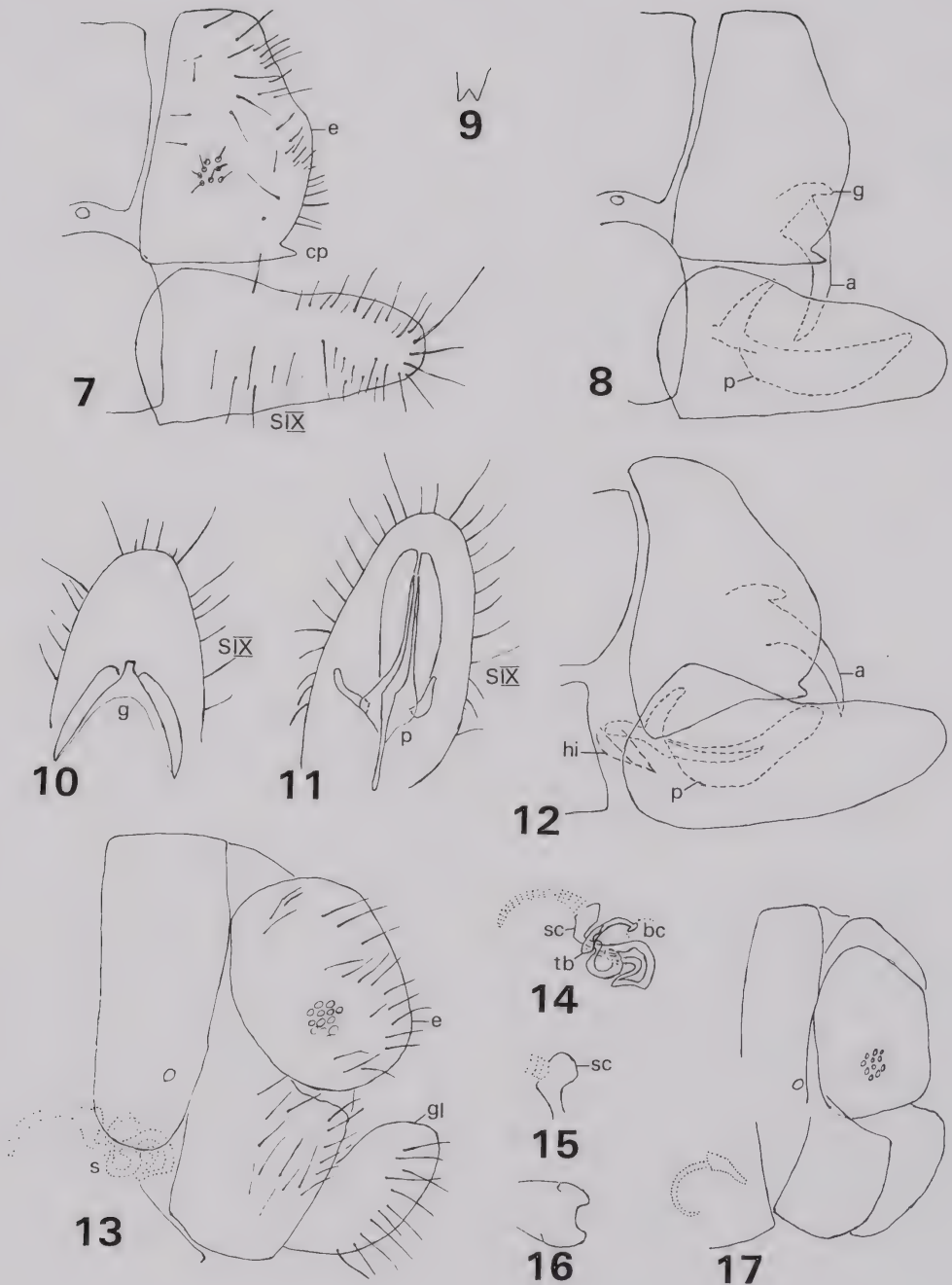
Head. Face (including labrum) pale, sometimes darker towards antennae, sometimes with darker or cream-coloured patch below each antenna. Dorsum (Fig. 3) extending anteriorly between antennae, setose; posteriorly tubercles arranged in short lines giving transversely corrugated appearance, pale brown with central pair of darker brown longitudinal stripes sometimes extending laterally. Head laterally pale brown with darker brown patch behind and below eye.

Prothorax (Fig.3) sparsely setose; laterally pale brown to cream, dorsally with wide median dark brown stripe darkest on median line. Legs setose, light brown, apical tarsal segment darker. Prothoracic tibiae tapering apex to base, mesothoracic swollen in apical third, metathoracic swollen in apical two-thirds.

Wings (Fig. 1). Elongate, tapering to rounded ends apically. Forewing lightly setose, thickest in pterostigma. Veins more or less tinged pink, sometimes light brown, with brown markings. Main veins sometimes with occasional dark dashes; gradate cross-veins in two series, brown. Membrane mainly clear, brown in patches on posterior side of radius, around cross-veins in two gradate series forming two obvious transverse bands, between two close



Figs. 5, 6. *Micromus* spp. Wing venation. ♀♀. 5. *M. bifasciatus*. 6. *M. tasmaniae*. (For abbreviations see description).



Figs. 7-17. *Micromus bifasciatus*. Genitalia. ♂. 7. Lateral. 8. Parameres *in situ*. Lateral. 9. Apex of arcessus. 10. Gonarcus and outline of Sternite IX. Dorsal. 11. Parameres and outline of Sternite IX. Ventral. 12. Another specimen. Lateral internal. Genitalia. ♀. 13. Lateral. 14. Spermatheca. 15. Spermatheca, subapical chamber. Another view. 16. Subgenitale. Ventral. 17. Another specimen. Dorso-lateral. (For abbreviations see description).

medial and cubital veins towards base extending most or entire length of cell forming an obvious streak, sometimes in well-spaced patches around wing margin, sometimes with length of shading along apical-posterior margins. Hindwing main veins sometimes pink, otherwise veins pale brown to colourless, sometimes parts of veins darker in apical-posterior areas, apical cross-veins darker. Membrane clear, sometimes tinged brown around apical cross-veins.

Wing venation (Fig. 5). Forewing with Costa (C) slightly bowed in basal half, costal area broadest at less than 1/4 of wing, humeral vein simple; some forked veinlets before pterostigma; pterostigma thickened, elongate along Subcosta (Sc), not touching Costa, smaller than in hindwing. One basal cross-vein Sc to Radius (R). Sc not fused with R. Sc with few forked veinlets at margin, remainder of veins with forked veinlets at margin. Radial sectors (Rs) and Medius (M) arise separately from R. One apical cross-vein R-Rs. Usually four Rs, rarely 3 or 5; cross-veins present in two gradate series Rs1- Medius anterior (Ma). Base of M present, forked with 2 cross-veins in fork; Medius posterior (Mp) forked with 1 cross-vein in fork. Two short cross-veins M, Mp- Cubitus anterior (Cua). Cubitus (Cu) forked near base with 2 cross-veins in fork, 1 cross-vein Cubitus posterior (Cup) to Anal 1 (A1). Three Anal veins (A1, A2, A3), with cross-veins.

Hindwing with costal area narrow, many simple veinlets. Pterostigma stronger than forewing, extending from Sc to C, with possibly a few forked veinlets apically. No basal cross-vein Sc-R. R forked at apex, remainder of veins with forked veinlets at margin. Rs arising basally with 4 branches, 2 basal cross-veins R-Rs (or 1 stem, 1 cross-vein), 1 apical cross-vein R-Rs. Cross-veins in two gradate series Rs1-Ma. M forked with 2 cross-veins in fork, 1 apical cross-vein Mp-Cua. Cua arises separately, 2 or 3 A present.

Abdomen. Brown, darker dorsally.

Genitalia (Figs. 7-17). ♂. Ectoproct (e) rounded apically, with short catoprocessus (cp) ventrally. Sternite IX (S IX) elongate, slipper-shaped (see *M. tasmaniae*); deeper at base, almost triangular in lateral view; rounded sides tapering slightly to rounded apex in dorsal/ventral views. Gonarcus (g) extended dorsally over base of arcessus (a); arcessus large, curved, sometimes with tip bifurcate. Parameres (p) fused at base (anteriorly), with a long slender dorsal process (lateral view); a pair of lateral processes; a pair of thin posterior processes extending into paired, upcurved, posterior membranous lobes. Hypandrium internum (hi) small.

♀. Ectoproct rounded posteriorly, gonapophyses laterales (gl) elongate. Spermatheca (s) internally (anteriorly) with apical curved sac, lightly chitinised with series of black points on surface, followed by a more chitinised chamber, (sub-apical chamber, sc) squared in outline; duct continuing slightly curved, then strongly curved to a recurved (u-shaped) bend followed by convolutions ending in a curved entry to bursa copulatrix (bc); a tapering body (tb) present on outside before straight ending to duct. Apex of subgenitale (sg) concave centrally in ventral view.

Wing lengths. Anterior: ♂♂ 6.25-7.25 mm, ♀♀ 5.75-7.5 mm. Posterior: ♂♂ 5.5-6.5 mm, ♀♀ 5.25-6.75 mm.

Specimens. Holotype. ?. West Plains, 29.9.05 [original label]. *Micromus bifasciatus* Till. Type ♀ R.J.T. [abdomen missing] (Tillyard 1923 - West Plains, near Invercargill, 29th September, 1905, A. Philpott, female). (NZAC).

Allotype. ♀. Tisbury, 1. 3. 20 [original label]. *Micromus bifasciatus* Till. Type ♂ R.J.T. (Tillyard 1923 - Tisbury, near Invercargill, 1st March, 1920, A. Philpott, male). (NZAC).

Paratype. ?. West Plains, 29.9.05 [original label]. Brit. Mus. 1939-45 [abdomen missing] (Tillyard 1923 - near Invercargill, A. Philpott, male). (BMNH).

Var. *amabilis*. On rimu, Silverstream, 10.10.20 [original label]. *Micromus bifasciatus* Till. var. *amabilis* Till. (Tillyard 1923 - on rimu, Silverstream, near Wellington, H. Hamilton, male). ♂ (NZAC).

Var. *imperfectus*. Gisborne, N.Z. [original label]. *Micromus bifasciatus* Till. var. *imperfectus* Till. (Tillyard 1923 - Gisborne). ♀ (NZAC).

- 79a (G.V. Hudson. Kaitoke, amongst young matai, Dec. 27-04). [“a” deleted]. Kaitoke, 27. XII. 1904, G.V. Hudson. *Micromus bifasciatus* Till. var. *amabilis* Det. R.J. Tillyard. ♀ (AMNZ).
- 79b (G.V.H. Gollans Valley, Oct. 24 1919, beaten from shrubs). 1 (NMNZ).
- 79c (G.V.H. Beaten out of rimu tree far edge of Makara Bush, Dec. 5 1922). Makara Bush, 5.XII.22, G.V. Hudson. B.M. 1933-274. 1 (BMNH).
- 79d (G.V.H. Ditto [Beaten out of rimu tree far edge of Makara Bush], May 30 1923). Wellington, G.V. Hudson. ♀ (NMNZ).
- 79e (G.V.H. Ditto May 30 1923). Wellington Makara Bush, G.V. Hudson. Brit. Mus. 1931-328. 1 (BMNH).
- 79f (G.V.H. Ditto May 30 1923). Wellington Makara Bush, G.V. Hudson. Brit. Mus. 1931-328. 1 (BMNH).
- 79g (G.V.H. Ditto May 30 1923). Wellington Makara Bush, G.V. Hudson. Brit. Mus. 1931-328. ♀ (BMNH).
- 79h (G.V.H. Ditto Aug. 8 1923). Wellington Makara Bush, G.V. Hudson. Brit. Mus. 1931-328. ♂ (BMNH).
- 79k (G.V.H. Ditto Aug. 8 1923). [Missing].
- 79l (G.V.H. Ditto Aug. 8 1923). Wellington Makara Bush, G.V. Hudson. Brit. Mus. 1931-328. ♂ (BMNH).
- 79m (G.V.H. Ditto Nov. 18 1923). [Missing].
- 79n (G.V.H. Ditto Apl. 17 1924). 1 (NMNZ).
- 79n (G.V.H. Ditto Apl. 17 1924). Makara Bush, 17.IV.1924, G.V. Hudson. B.M. 1933-274. ♂ (BMNH).
- 79p (G.V.H. Ditto May 7 1925). [Missing].
- 79q (G.V.H. Ditto May 7 1925). 1 (NMNZ).
- 79r (G.V.H. Ditto Oct. 29 1925). Wellington Makara Bush, G.V. Hudson. Brit. Mus. 1931-328. ♀ (BMNH).
- 79s (G.V.H. Ditto Dec. 5 1925). [Missing].
- 79t (G.V.H. Ditto Dec. 5 1925). 1 (NMNZ).
- 79u (G.V.H. Ditto Dec. 5 1925). [Missing].
- 79v (G.V.H. Ditto Nov. 17 1926). Wellington Makara Bush, G.V. Hudson. Brit. Mus. 1931-328. ♂ (BMNH).
- 79x (G.V. H. Ditto Feb. 24 1927). [Missing].
- 79y (G.V.H. Ditto Aug. 29 1927). [Missing].

- 79z (G.V.H. [Ditto] Feb. 25 1928), 2 (NMNZ).
 79α (G.V.H. Ditto July 28 1928). [“α” deleted]. [Missing].
 79β (G.V.H. Ditto Nov. 24 1928). [Missing].
 79γ (G.V.H. Makara Bush, Aug. 3 1929). Makara Bush, 3.VIII.1929, G.V. Hudson. B.M. 1933-274. ♀ (BMNH).
 79δ (G.V.H. Ditto [Makara Bush] Jan. 16 1930). Makara Bush, 16.I.1930, G.V. Hudson. B.M. 1932-218. ♀ (BMNH).
 Makara Bush, 16.I.1930, G.V. Hudson. B.M. 1932-218. ♂ (BMNH).
 79ε (G.V.H. Ditto Apl. 17 1930). 1 (NMNZ).
 79α (G.V.H. Ditto Feb. 19 1934). Makara Bush, beaten from rimu, G.V. Hudson. B.M. 1935-176. 2♂♂, 1♀ (BMNH).
 79. Makara Bush, 25.I.1936. G.V. Hudson, B.M. 1936-724. ♂,♀ (BMNH).
 79ζ (G.V.H. Wiltons Bush, Feb. 17 1937). 1 (NMNZ).
 79 Gollans Valley, 20.XII.1937, G.V. Hudson. Brit. Mus. 1938-203. ♂,♀ (BMNH).
 79E (G.V.H. Gollans Valley, Jan. 12 1942). [“E” deleted]. [Missing].
 79θ (G.V.H. Beaten out of small native pine Wiltons Bush, Oct. 7 1943. 2). 2 (NMNZ).
 79λ (G.V.H. Wilton’s Bush, Oct. 24 - Dec. 31 1946). 8 (NMNZ).

- N. Hokianga. W. of Motuti R. mouth. Swept manuka in alluvial Kahikatea forest, 10.X.1985, R.F. Gilbert. Northland “At risk” areas survey. ♂ (AMNZ).
 Titirangi, 2.9.16 [original label]. Titirangi, 2.IX.1916, A.E. Brookes, 1919-201. *M. bifasciatus* Till. v. *amabilis* Till. det. D.E.K. ♀ (BMNH).
 Huia, beaten *Podocarpus dacrydioides*, 4.X.1973, B.M. May. ♀ (NZAC).
 Swept ex kahikatea, Karamatua Vy., Huia, 15.IV.1982, K.A.J. Wise. ♀ (AMNZ).
 Naike, 7.III.1989, M. & P. Burnell. ♀ (AMNZ).
 Naike, house lights, 15.I.1990, M. Burnell. ♀ (AMNZ).
 Owaka, 15.1.1959, J.I. Townsend. 1 (NZAC).
 Pureora, Waipapa Res. 570 m, Malaise trap in Podocarps, 23.II.1984, J. Hutcheson. ♀ (NZAC).
 Lake Waikaremoana, 12.XII.1946, R. Forster. ♂ (NMNZ).
 Ohakune, V-VII.1923, T.R. Harris B.M. 1923-419. *Micromus bifasciatus* Till. det. D.E. Kimmins. ♂ (BMNH).
 On rimu, Silverstream, 10.X.1920 [original label 10.10.20], ♀ (NZAC).
 Aorere Vy., 7.X.1964, E.S. Gourlay. ♀ (NZAC).
 Kenepuru Snd., foot Mt. Stokes, general beating, 10.X.1967, J.I. Townsend. ♀ (NZAC).
 Pelorus B. [Pelorus Snd.] 28.XI.1928, A. Philpott. ♀ (NZAC).
 Paroa nr Greymouth, 10 m a.s.l., 20-28.II.1990, B.M. Lyford. ♂ (AMNZ).
 Lake Moana, 16-21.XII.1925, A. Tonnoir. 1 (CMNZ).
 Christchurch [area], -.VIII.1919, Campbell. ♂, 1. (NMNZ).
 Kaituna [Kaituna Lagoon], 10.II.1971, Ento Dept. Field Trip. ♀ (LCNZ).
 Lower Hollyford Vy., Hidden Falls Tr., general beating, 14.XII.1966, A. Walker. ♂ (NZAC).
 Waenga Bush, beating at night, 16.IX.1992, G. Hall. ♂ (NZAC).
 Waitati, 21.XI.1926, C.E. Clark. ♂ (AMNZ).
 Stewart I. Sawdust Bay Stm., N. end, 5 m, 16.I.1993, J.B. Ward, T.R. Hitchings. ♂, ♀ (AMNZ).
 Stewart I. Rakeahua Vy., beating, 12.II.1968, G. Kuschel, Stewart I Exp. Feb 1968. ♂, ♀ (NZAC).
 Stewart I. Rakeahua Vy., Litter 68/49, -.II.1968, G. Kuschel, Stewart I Exp. Feb. 1968. ♂, ♀ (NZAC).

- Stewart I. Port Pegasus, Twilight Bay, 22.II.1968, G. Kuschel, Stewart I Exp. Feb. 1968. ♀ (NZAC).
 Stewart I. Port Pegasus, Twilight Bay, Litter 68/59, 22.II.1968, G. Kuschel. ♀ (NZAC).
 Stewart I. Port Pegasus, Twilight Bay, Moss 68/62, 22.II.1968, G. Kuschel. ♂ (NZAC).
 Stewart I. Pegasus Ck., Litter 68/66, 24.II.1970 [error for 1968], G. Kuschel. ♀ (NZAC).
 Stewart I. Pegasus, 21-25.II.1968, G. Kuschel, Stewart I Exp. Feb. 1968. ♂ (NZAC).
 Stewart I. Port Pegasus, Rosa I, 29.II.1972, L.C. Hudson. ♂ (NMNZ).
 [No data]. ♂ (AMNZ).

The above records are listed in order of types and original specimens, then G.V.Hudson specimens and the remainder geographically from north to south.

Varieties of *M. bifasciatus* described by Tillyard (1923) are within a range of variation for the species and not valid entities, so they are included in the description and list above.

Type specimens. The allotype specimen, labelled and recorded by Tillyard (1923) as a male, is a female. This error throws doubt on the sex given by Tillyard for the other two types, both of which are now without abdomens. Tillyard recorded only three type specimens, all from near Invercargill, so the specimen found in the BMNH collection is the paratype, although previously not so labelled; it has an original label with printed locality and handwritten date, as does the holotype specimen.

Type localities (Fig. 29). New Zealand: South Island. The three specimens recorded as types by Tillyard (1923) were taken near Invercargill, the holotype and paratype from West Plains and the allotype from Tisbury.

Distribution (Fig. 29). As previously recorded (Wise 1991), this endemic species occurs from the far north to Stewart I. The first records by Tillyard (1923) were of specimens from the south of the South I, together with two others from the North I. There are several collecting localities in the Wellington area, at the south end of the North I, due mainly to the collecting of G.V. Hudson, between 1904 and 1946. Although several specimens have been found in the north of the North I in more recent years, a specimen taken near Auckland in 1916 probably indicates that the species has long been established there.

Most of Stewart I is still isolated and wild and there is only one settlement, at Halfmoon Bay. Specimens have been taken during a few collecting expeditions in 1968, 1972 and 1993, in areas of endemic forest.

Life history. There is little information available for this species. G. V. Hudson collected *M. bifasciatus* from matai at Kaitoke, near Wellington, in December 1904 and from rimu at Makara Bush, west of Wellington, in all months of the year except March, June and September, between 1922 and 1934, which indicates an established population in which adults appear almost all year. Specimens in other collections have been taken in all months except May, June and July, so June (early winter) is the only non-recorded month.

Micromus bifasciatus has been mostly recorded from native forest, or forest remnants, and in particular from endemic matai (black pine, *Prumnopitys taxifolia*), rimu (red pine, *Dacrydium cupressinum*), kahikatea (white pine, *Dacrycarpus dacrydioides*) and “native

pine". Of the three named podocarp trees, rimu has its own host specific species of scale insect while kahikatea has an endemic scale insect which also occurs on an endemic *Podocarpus* species (Spiller & Wise 1982). Morales (1991) has recorded another species on matai, kahikatea and a *Podocarpus*. Mealy-bug species are also present on all these podocarps (Cox 1987). Various Coccoidea could constitute the food supply for this predatory neuropteran, particularly as there are few species of endemic Aphidoidea in New Zealand and none on podocarps.

Hudson noted in his register in 1923 and recorded later (1950) that when resting with closed wings this insect exactly resembles a small dried fragment of rimu foliage. He recorded also that it is never common but occurs sparingly amongst rimu foliage, or the foliage of other native podocarps.

White (unpigmented) adults of this species have been taken from samples of leaf litter which suggests that larvae pupate in that situation.

Micromus tasmaniae (Walker, 1860)

(Figs. 2, 4, 6, 18-28, 29)

- Hemerobius tasmaniae* Walker, 1860, Trans. Ent. Soc. London (N.S.) 5 (5): 186 (Tasmania). [*Micromus tasmaniae*]: McLachlan, 1869, Ent. Mon. Mag. 6: 27 (New Holland, New Zealand).
Micromus tasmaniae: McLachlan, 1873, Ann. Mag. Nat. Hist. (4)12 (67):39 (Australia, NZ).
Micromus tasmaniae: Hutton, 1874, Trans. Proc. N.Z. Inst. 6: 168 (NZ).
Micromus tasmaniae: McLachlan, 1874, Trans. Proc. N.Z. Inst. 6: App. xcvi (Aust, NZ) [Repr. of McLachlan, 1873].
Micromus tasmaniae: Hagen, 1886, Proc. Boston Soc. Nat. Hist. 23: 291 (Aust, NZ).
Chrysopa: Broun, 1898, Rep. Dep. Agric. N.Z. 1898: 217 (NZ) [Prob. this species].
Micromus tasmaniae: Hutton, 1899, Trans. Proc. N.Z. Inst. 31: 233 (Aust, NZ).
Micromus tasmaniae: Alfken, 1904, Zool. Jb. 19: 601 (Aust, NZ, Chatham Is).
Micromus tasmaniae: Hutton, 1904, Index Faunae Novae Zealandiae, 230 (NZ).
Micromus tasmaniae: Hudson, 1904, New Zealand Neuroptera, 57 (Aust, NZ).
Micromus tasmaniae: Tillyard, 1923, Trans. N.Z. Inst. 54: 223 (Aust, NZ).
Micromus tasmaniae var. *manapouriensis* Tillyard, 1923, Trans. N.Z. Inst. 54: 223 (NZ).
Micromus tasmaniae var. *nigroscripatus* Tillyard, 1923, Trans. N.Z. Inst. 54: 223 (NZ).
Micromus tasmaniae: Tillyard, 1926, Insects of Australia and New Zealand, 318. (Aust, NZ).
Eumicromus tasmaniae: Kimmins, 1941, Ent. Mon. Mag. 77: 135 (Aust, NZ).
Micromus tasmaniae: Hudson, 1950, Fragments New Zealand Entomology, 117 (NZ).
Nesomicromus tasmaniae: Kimmins, 1958, Bull. Brit. Mus. (Nat. Hist.) Ent. 6 (9): 242 (Aust, NZ).
Austromicromus tasmaniae: Nakahara, 1960, Mushi 34 (1): 35 (Aust, NZ).
Micromus tasmaniae: Wise, 1963, Pacific Ins. 5 (1): 55 (Aust, NZ, Chatham Is).
Micromus tasmaniae: Wise, 1971, Pacific Ins. Monogr. 27: 53 (NZ, Chatham Is, Auckland Is, Antipodes Is).
Micromus tasmaniae: Wise, 1972, Rec. Auckland Inst. Mus. 9: 270 (Aust, NZ, Kermadec Is).
Micromus tasmaniae: Wise, 1973, N.Z. Ent. 5 (2): 184 (Aust, Kermadec Is, NZ, Chatham Is, Antipodes Is, Auckland Is).
Micromus tasmaniae: Wise, 1977, Bull. Auckland Inst. Mus. 11: 132 (Kermadec Is, NZ, Chatham Is, Antipodes Is, Auckland Is).

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Micromus tasmaniae : Monserrat, 1990, *In Advances in Neuropterology*, 230 (Aust).

Micromus tasmaniae var. *manapouriensis* : Monserrat, 1990, *In Advances in Neuropterology*, 230 (NZ).

Micromus tasmaniae var. *nigroscriptus* : Monserrat, 1990, *In Advances in Neuropterology*, 230 (NZ).

Micromus tasmaniae : Wise, 1991, *Rec. Auckland Inst. Mus.* 28: 212, 214 (Aust, Kermadec Is, NZ, Chatham Is, Antipodes Is, Auckland Is).

Small, brown species. Wings clear, except for slight darkening around some cross-veins; anterior wings liberally spotted with dark brown on veins, with two dark transverse thin lines one near midway one sub-apical, and an obvious dark spot between two close veins towards base; posterior wings with some dark spots around margin, some dark veins and cross-veins in apical and posterior areas. Membrane of most cells of forewings waved; appearance of median bar in each cell (see Fig. 2) caused by a median trough, not a pigment difference.

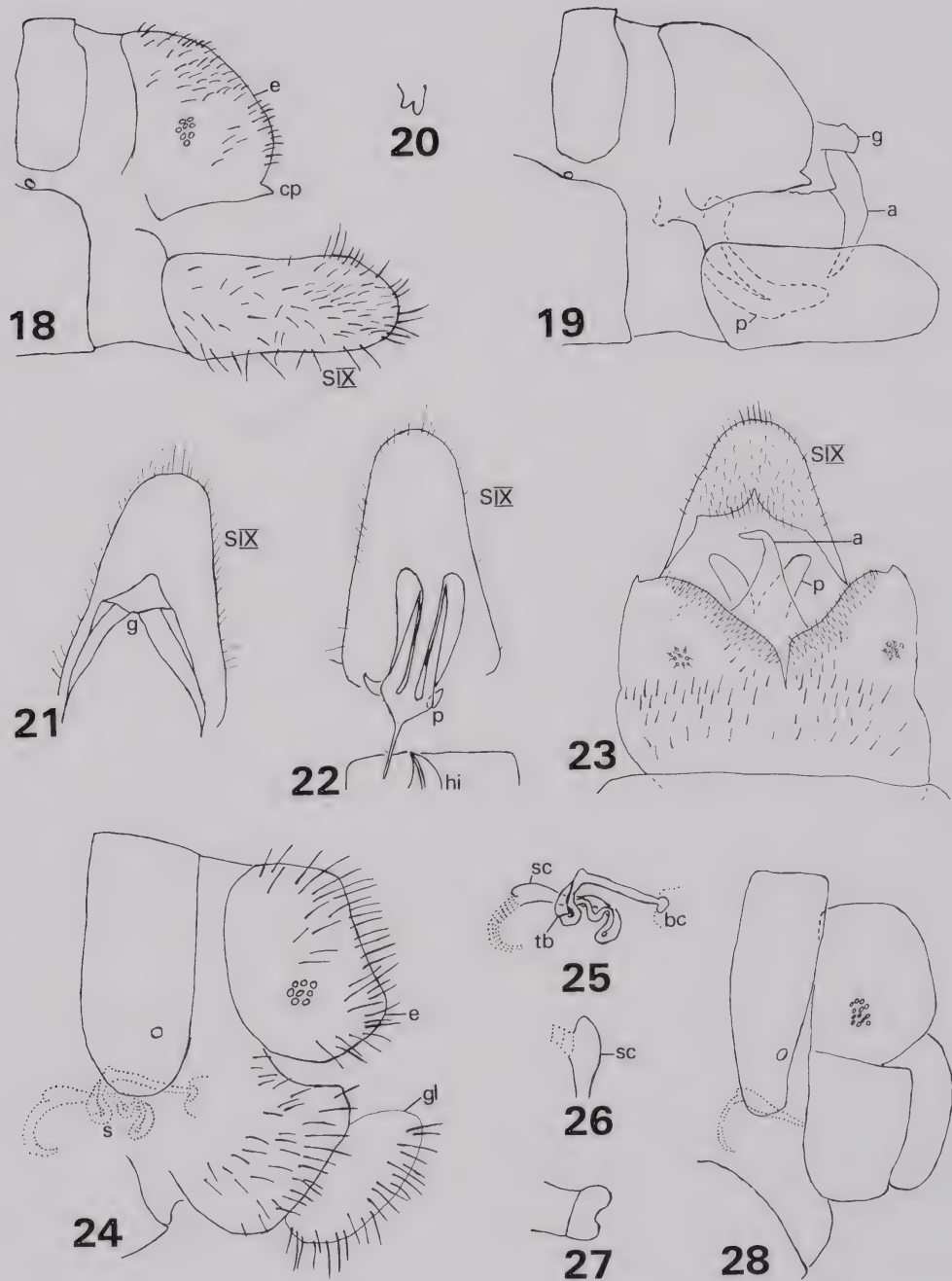
Antennae. Almost unicolorous light brown, darker towards apex; scape large, basal flagellar segment larger than remainder. Males, scape plus 45-58 flagellar segments; females, scape plus 54-64 flagellar segments.

Head. Face (including labrum) pale brown. Dorsum (Fig. 4) extending anteriorly between antennae, setose; posteriorly with irregular tubercles, pale brown with pair of dark brown marks surrounding a smooth pale spot, each mark in shape of stylised head of shepherd's crook. Head laterally pale brown, sometimes with darker brown vertical line behind eye.

Prothorax (Fig. 4) sparsely setose, laterally dull cream, dorsally dark cream with wide median dark brown strip enclosing thin, pale strip on median line. Legs setose, pale brown, apical tarsal segment darker; fore tibiae slightly swollen before apex, mid tibiae swollen before apex, hind tibiae swollen apical two-thirds.

Wings (Fig. 2) elongate, tapering to rounded ends apically. Forewing lightly setose, thickest in pterostigma. Veins light brown with dark brown dashes and spots; gradate cross-veins in two series, dark brown, forming two transverse thin lines. Membrane clear, brown in small patches around apical cross-veins, between two close medial and cubital cross-veins towards base forming an obvious spot, also spots around wing margin. Hindwing main veins light brown to colourless, sometimes parts of veins darker in apical and posterior areas, apical cross-veins darker. Membrane clear, with occasional dark patches on posterior margin.

Wing venation (Fig. 6). Forewing with Costa (C) bowed in basal half, costal area broadest at c. 1/4 of wing, humeral vein simple, some forked veinlets before pterostigma; pterostigma thickened, elongate along Subcosta (Sc), not touching C, smaller than in hindwing. One basal cross-vein Sc to Radius (R). Sc not fused with R. Sc with few forked veinlets at margin, remainder of veins with forked veinlets at margin. Radial sectors (Rs) and Medius (M) arise separately from R. One apical cross-vein R-Rs. Usually four Rs, occasionally 3 or 5 (6 recorded by New 1988); cross-veins present in two gradate series Rs1-Medius



Figs. 18-28. *Micromus tasmaniae*. Genitalia. ♂. 18. Lateral. 19. Parameres *in situ*. Lateral. 20. Apex of arcessus. 21. Gonarcus and outline of Sternite IX. Dorsal. 22. Parameres and outline of Sternite IX. Ventral. 23. Another specimen. Dorsal. Genitalia. ♀. 24. Lateral. 25. Spermatheca. 26. Spermatheca, subapical chamber. Another view. 27. Subgenitale. Ventral. 28. Another specimen. Lateral. (For abbreviations see description).

anterior (Ma). Base of M present, forked with 2 cross-veins in fork; Medius posterior (Mp) forked with 1 cross-vein in fork. Two short cross-veins M, Mp-Cubitus anterior (Cua). Cu forked near base with 2 cross-veins in fork, 1 cross-vein Cubitus posterior (Cup) to Anal 1 (A1). Three anal veins (A1, A2, A3), with cross-veins.

Hindwing with costal area narrow, many simple veinlets. Pterostigma stronger than forewing, extending from Sc to C, with possibly a few forked veinlets apically. No basal cross-vein Sc-R. R forked at apex, remainder of veins with forked veinlets at margin. Rs arising basally with 4 branches, 2 basal cross-veins R-Rs (or 1 stem, 1 cross-vein), 1 apical cross-vein R-Rs. Cross-veins in two gradate series Rs1-Ma. M forked with 2 cross-veins in fork, 1 or 2 apical cross-veins Mp-Cua. Cu arises separately, 2 or 3 A present.

Abdomen dark brown, sometimes paler ventrally; terminal segments pale.

Genitalia (Figs. 18-28). ♂. Ectoproct (e) setose, rounded apically, with short catoprocessus (cp) ventrally. Sternite IX (S IX), elongate, slipper-shaped; dorsal/ventral outlines almost parallel in lateral view; tapering with rounded apex in dorsal/ventral views. Gonarcus (g) extended dorsally over base of arcessus (a); arcessus large, curved, sometimes with tip bifurcate. Parameres (p) fused at base (anteriorly), with a short, broad dorsal process (lateral view); a pair of lateral processes; a pair of thin posterior processes extending into paired, upcurved, posterior membranous lobes. Hypandrium internum (hi) small.

Note. In both species, S IX appears as if the postero-lateral corners of a quadrangular sternite have curled dorsally coming together at the median line (see Fig. 23) and forming a shape like a slipper with covered apical area and curved, raised sides.

♀. Ectoproct (e) rounded posteriorly, gonapophyses laterales (gs) elongate. Spermatheca (s) internally (anteriorly) with apical curved sac, lightly chitinised with series of black points on surface, followed by a more chitinised chamber (sub-apical chamber, sc) slender in outline; duct continuing slightly curved, then strongly curved to a re-curved (u-shaped) bend followed by convolutions ending in a straight entry to bursa copulatrix (bc); a tapering body (tb) present on outside before straight ending to duct. Apex of subgenitale (sg) concave centrally in ventral view.

Wing lengths. Anterior: ♂♂ 5.0-7.5 mm, ♀♀ 6.0-8.0 mm. Posterior: ♂♂ 4.25-6.75 mm, ♀♀ 5.25-7.25 mm.

Specimens. Lectotype. ♀. Saunders 68.3. VDL [Van Diemen's Land]. Tasmaniae W. *Hemerobius tasmaniae* W det. D.E. Kimmins. Type. (BMNH).

Paralectotype. ♀. Saunders 68.3. *Hemerobius tasmaniae* W det. D.E. Kimmins. Paratype. (BMNH).

Paralectotype. ?. Saunders 68.3. *Hemerobius tasmaniae* W det. D.E. Kimmins. Paratype. [3 wings only, body missing]. (BMNH).

N. Zeal. *Micromus tasmaniae* Wlk. McLachlan Coll. BM 1938-674. ♂, ♀ (BMNH).

48 C.M. Wakefield ChCh NZ. McLachlan Coll. BM 1938-674. 1 (BMNH).

Chatham Isld. 1899. *Micromus tasmaniae* Walk. McLachlan Coll. BM 1938-674. ♀ (BMNH).

New Zealand 97-166. 96. *Micromus tasmaniae* Walk ♀ det. D.E.K. ♂ (BMNH).

- (10a) New Zealand Hudson. *Micromus tasmaniae* Wlk. McLachlan Coll. BM 1938-674. ♀ (BMNH).
- (10b) New Zealand Hudson. *Micromus tasmaniae* Walk. McLachlan Coll. BM 1938-674. 1 (BMNH).
- 10c (G.V.Hudson. Amongst herbage Botanicals [Botanical Gardens]). 1 (NMNZ).
- 10d (G.V.H. Amongst herbage Botanicals [Botanical Gardens]). [Missing].
- 10e (G.V.H. Amongst herbage Botanicals [Botanical Gardens]). [Missing].
- 10g (G.V.H. Bush Hill Karori, April 3 89). [Missing].
- 10h (G.V.H. Bush Hill Karori, April 3 89). Wellington Hudson. McLachlan Coll. BM 1938-674. ♀ (BMNH).
- 10k (G.V.H. Herbage Botanicals, Oct. 89). [Missing].
- 10l (G.V.H. Ditto [Herbage Botanicals], Dec. 90). [Missing].
- 10m (G.V.H. Ditto, Dec. 90). [Missing].
- 10n (G.V.H. Ditto, Dec. 90). Wellington, Dec. 1890, G.V. Hudson. 1 (CMNZ).
- 10o (G.V.H. Wadestown, Jan. 17 97). [Missing].
- 10a (G.V.H. "summer 94-95 W'ton" (ex coll. Hawth.)). [Missing].
- 10b (G.V.H. Campbells stream, Jan. 1 1900). 1 (NMNZ).
- 10p (G.V.H. Reservoir Reserve Karori, Oct. 22 1911). [Missing].
- 10q (G.V.H. ditto [Reservoir Reserve Karori], Apl 21 1912). Karori Reservoir Reserve, April 1912, G.V. Hudson. B.M. 1933-274. ♂ (BMNH).
- 10r (G.V.H. Groves Bush Karori Nov. 7 1915). 1 (NMNZ).
- 10s (G.V.H. Waterfall gully Wadestown, Dec. 7 1919). 1 (NMNZ).
- 10s (G.V.H. Waterfall Gully Wadestown, Dec. 7 1919). Wiltons Bush, 7.XII.1919, G.V. Hudson. Brit. Mus. 1938-203. ♀ (BMNH).
- 10t (G.V.H. Kinloch Lake Wakatipu, early Jan. 1921). [Missing].
- 10v (G.V.H. Bush Hill Karori, Feb. 27 1921). 1 (NMNZ).
- 10w (G.V.H. Gollans valley, Jan. 30 1923). Gollans Valley, 30.1.23. G.V.Hudson, B.M. 1936-724. ♀ (BMNH).
- (10u) Wiltons Bush, 1894 [in error]. G.V. Hudson, B.M. 1936-724. ♀ (BMNH).
- 10x (G.V.H. Makara Bush, Feb. 21 1923). [Missing].
- 10y (G.V.H. Wilton's Bush, Dec. 14 1927). 1 (NMNZ).
- (10a) Gollans Valley, Dec. 1932, G.V. Hudson, B.M. 1933-274. 1 (BMNH).
- (10d) Wiltons Bush, 9.ii.33, G.V.Hudson. B.M. 1933-274. ♂ (BMNH).
- (10) Karori Reservoir Reserve, 18.X.1934, G.V. Hudson. Brit. Mus. 1935-176. ♀ (BMNH).
- 10z (G.V.H. South Karori, Oct. 5 1935). 1 (NMNZ).
- 10z (G.V.H. South Karori, Oct. 5 1935). South Karori, 5.X.35. G.V. Hudson, BM. 1936-724. ♀ (BMNH).
- 10A (G.V.H. Reservoir Reserve [Karori], Nov. 9 1935). 1 (NMNZ).
Wainuiomata, 27.2.1936, G.V.Hudson. Brit. Mus. 1937-209. ♀ (BMNH).
- 10B (G.V.H. [A re-used number, previous data deleted.] Wiltons Bush, Dec. 28 1942). 1 (NMNZ).
- 10C (G.V.H. Gollans Valley, Jan. 12 1942). [Missing].
- 10D (G.V.H. Wilton's Bush, Dec. 8 1943). 1 (NMNZ).
- 10E (G.V.H. Haywards, Mch. 27 1944). 1 (NMNZ).
- 10F (G.V.H. Bred from larva obtained at Haywards, 16 Dec. 1944, emerged Feb. 3 1945). 1 (NMNZ).
- Paihia, swept, swamp, 1.I.1986, K.A.J. Wise. ♂ (AMNZ).

Paihia, at light, 3.XI.1991, K. Lodge. ♀ (AMNZ).
 Titirangi, .III.1915, A.E. Brookes, 1919-201. *M. tasmaniae*. 1 (BMNH).
 Titirangi, .III.1915, A.E. Brookes, 1919-201. ♂ (BMNH).
 Ohakune, .XI.1922, T.R. Harris, B.M. 1923-13. *Micromus tasmaniae* Walk. det. D.E. Kimmins. ♂+3 (BMNH).
 Ohakune, 1922-1923, T.R. Harris, B.M. 1923-303. ♀ +7 (BMNH).
 Te Kaha, Whanarua Bay, swept vegetation by roadside, 4.I.1987, R.S. Gilbert. ♀ (AMNZ).
 New Brighton, Dyer's Road, 11.XI.1922, J.W. Campbell, B.M. 1923-14. ♂ (BMNH).
 Governors Bay, 2.XII.1921, E.S. Gourlay. Pres. by J.W. Campbell, B.M. 1922-245. ♀ (BMNH).
 West Plains, 6.11.05 [original label]. 1 (NZAC).
 Stewart I. Halfmoon Bay, 1.II.1969, A.C. Eyles. ♂ (NZAC).

The above records are listed in order of types, early specimens (being mostly McLachlan collection), then G. V. Hudson specimens and the remainder, being a selection of BMNH and other specimens used for the present paper, geographically from north to south.

G.V. Hudson appears to have used some letters more than once, possibly for reference in correspondence. Such use, where recognised, has been indicated in the list above by placing the number/letter combination in parenthesis. Some specimens included in Hudson's register have not been found and some are recorded below as varieties. At the beginning of the *Micromus tasmaniae* entries (number 10) in the register, 'a', 'b' are not included and may have been the specimens so labelled sent to McLachlan. Hudson used 'a' and 'b' after the 1897 entry 'o' and 'a,b,c,d' for specimens in 1932-33. After a first use of 'u' in 1921 (see varieties below), a second use is here placed with 'w' as they were sent to BMNH at the same time (1936) and the date could be in error.

Type specimens. There are three specimens in the BMNH collection, each with a printed 'Saunders 68.3' label. As Walker (1860) described both male and female and gave minimum-maximum measurements he must have examined at least two specimens, and presumably three (the two with abdomens now are both females), but he did not designate types. These specimens are, therefore, syntypes and such labels have in recent years been placed in the drawer beside the specimens by S.J. Brooks. The 'Type' and 'Paratype' labels may well have been placed there by D.E. Kimmins. Consequently, the specimens are now designated and labelled as 'Lectotype' and 'Paralectotype'.

The lectotype has two extra handwritten labels which appear to be old; one of them, 'VDL', is considered by the present author to be a locality label for Van Diemen's Land and the other, 'Tasmaniae W.', a determination label for the species. The latter label (considered by New 1988 to be a locality label) has a partial ink-blot at the end of the name but the 'a' and 'e' are distinguishable as being written together in the 'æ' form, as they were printed in Walker's 1860 paper.

Type locality. Australia: Tasmania (previously Van Diemen's Land). The locality 'Tasmania' given by Walker (1860) was correct as the name was officially changed in 1856.

Distribution (Fig. 29). McLachlan (1869) gave the first record of *Micromus tasmaniae* for this country, "...and [I] possess two individuals from New Zealand...". The two specimens

now in BMNH labelled 'N. Zeal.' may be those original specimens. The McLachlan Collection specimen from Chatham Is, dated 1899, confirms the record for that island group by Alfken (1904).

The previously known range within New Zealand (Wise 1991) was from the far north of the North Island to the southern end of the South Island, where a specimen had been taken at West Plains in the same year as *M. bifasciatus* types. It is now extended to Stewart I as one specimen was taken in the settlement area of Halfmoon Bay. In the New Zealand sub-region the species is also known from Kermadec Is, Chatham Is, Antipodes Is and Auckland Is.

Anomalous specimens. Some specimens of *Micromus tasmaniae*, previously thought to be varieties, have been examined and found to differ from this species in some respects. Preliminary descriptions, given below, suggest an alternative origin which is discussed.

"Micromus tasmaniae var. *manapouriensis*"

Two specimens, one appears big for species, both appear broad-winged; wings appear plain, veining more obvious than spotting.

Antennae. Almost unicolorous, pale; scape large. Females, scape plus 61, 65 flagellar segments.

Head. Face (including labrum) pale. Dorsum posteriorly strongly rugose (as *bifasciatus*), with a pair of dark patches, no sign of usual *tasmaniae* markings. Head laterally light brown, slightly darker behind eyes.

Prothorax sparsely setose, darker brown dorsally, no obvious pale median strip except 1 specimen with short, pale spot posteriorly, 1 specimen with short, pale spots anteriorly and posteriorly. Legs pale brown.

Wings. Forewing similar to *tasmaniae*, some veins pinkish, brown spotting not strong. Spotted on radius at radial sectors. Membrane shaded golden brown; one specimen with short, faint spot between short marks on close medial and cubital veins towards base (as *tasmaniae*), one with cell membrane slightly darker in basal 3/4 of cell and no spot (more as *bifasciatus*). Hindwings with some veins slightly pinkish.

Wing venation. Forewing as *tasmaniae*; 4 Radial sectors, 1 specimen with aberration in 1 wing with basal Radial sector arising from medial vein.

Abdomen darkish brown, terminal segments slightly paler.

Wing lengths. ♀♀ Anterior: 7.25-8.25 mm. Posterior: 6.5-7.5 mm.

Specimens. Manapouri, 13.2.20 [original labels, 2 spec.]. *M. tasmaniae* Walk. var. *manapouriensis* Till. [1 spec.] (Tillyard 1923 - 13th February, 1920, Philpott, 2). 2 ♀♀ (NZAC).

Although Tillyard (1923) did not record a locality for this variety, his label on one of the

two specimens and the derivation of the varietal name from a place, being the place where they were collected (Manapouri), makes it certain that these are the correct specimens.

“Micromus tasmaniae var. nigroscriptus”

Small pale specimen (NZAC). Wings almost without markings, only dark apical marks present. Two specimens in the BMNH collection have dark marks towards the apex. Two recent specimens (AMNZ) with head, body, upper legs suffused with pale green; anterior wings suffused with pale golden-brown, dark brown-black apical patch.

Antennae pale. Scape large. Scape plus 65 flagellar segments, other specimens with 57-64.

Head. Face (including labrum) pale. Dorsum posteriorly with pair of brown marks in same form as *tasmaniae*; one (BMNH) with corrugations (as *bifasciatus*). Head laterally pale. Recent specimens dorsally with smooth pale spots (as *tasmaniae*), laterally with light brown mark behind eyes continuing as lateral line on prothorax.

Prothorax sparsely setose. Dark brown dorsally with thin pale median strip partially visible. Other specimens with mid-dorsal line darker (as *bifasciatus*), or with pale mid-dorsal line (more as *tasmaniae*) partial or not distinct. Legs pale.

Wings. Forewing membrane, most veins/veinlets colourless. Slight dotting on radius at radial sectors. Parts of veins, outer gradate cross-veins light brown (marks described as black, Tillyard 1923) in apical area of radius to radial sector 4. Four inner gradate cross-veins light brown. Membrane between two close medial and cubital veins towards base slightly darker in elongate central area of cell (described as curved black stripe, Tillyard 1923; as *bifasciatus*). Cubitus vein light brown showing as light brown line to marginal veinlets then short extension towards base. Two BMNH specimens, with veins pale or pinkish; anterior wings spotted with brown or pink, with isolated dark patch towards apex, dark mark towards base, 1 with dark streak between close medial and cubital veins (as *bifasciatus*). Two recent specimens (AMNZ), spotted on costa and radius particularly at 4 radial sectors (as *tasmaniae*), 1 with apical dark patch formed by coalition of dark markings, also with dark streak on membrane between two close medial and cubital veins towards base for 2/3 of cell (as *bifasciatus*); 1 with cross-veins brown in apical area, apical patch reduced, also with brown spot between close veins towards base (as *tasmaniae*). Hindwing veins and membrane colourless except for light brown in apical radius to radial sector area, cubitus vein to margin light brown. Recent specimens mainly clear; 1 dark with dark apical patch, 1 light with apical cross-veins brown. Markings re-inforce dark marks of anterior wings when wings closed.

Wing venation. Forewing with 4 Radial sectors.

Abdomen. Missing (from original specimen). One BMNH specimen, abdomen pale brown. Two recent specimens (AMNZ), abdomen darker dorsally.

Wing lengths. ♀♀ Anterior: 7.25-8.0 mm. Posterior: 6.75-7.25 mm.

Specimens. Nelson N.Z., 29.12.20, A. Philpott [original label]. *M. tasmaniae* (Wlkr) var. *nigroscriptus* Till. (Tillyard 1923 - Nelson, 29th December, 1920, Philpott, 1). 1 (NZAC).

(10b) Gollans Valley, Dec. 1932, G.V. Hudson B.M. 1933-274. ♀ (BMNH).

(10c) Gollans Valley, Dec. 1932, G.V. Hudson B.M. 1933-274. *M. tasmaniae* v. *nigroscriptus* Till. det. D.E. Kimmins. ♀ (BMNH).

Woodhaugh, Dunedin, 7.I.1990, B.H. Patrick. 2 ♀♀ (AMNZ).

The specimens of *nigroscriptus* are so distinct that the present author reacted to recent fresh specimens as did Tillyard who stated (1923) "At first sight it would appear to be a new species ...". He also noted that the corresponding portions of forewings and hindwings were marked in black so with the wings folded the darkened areas reinforced each other.

"*Micromus tasmaniae* var."

10u (G.V.H. Lower slopes of Mt Aurum, Jan. 17-19 1921, 3000 feet [c. 914 m]). 1 (NMNZ).

This specimen, recently brought to notice (NMNZ), has even more widespread dark markings on veins and membrane of the forewing and also on veins of the hindwing, particularly along the costa. It is included here as it is other than typical, but it has not yet been closely examined.

Distribution of anomalous specimens (Fig. 29). Of the two named varieties, specimens of *manapouriensis* occurred at one locality in the South Island and those of *nigroscriptus* at two localities in the South I and one in the North I. The unnamed 'variety' is from the southern South I. They are all within the range for *M. tasmaniae*.

Life history. *Micromus tasmaniae* was collected by Hudson since at least 1889 in the Wellington area and he recorded (1904) that adults occur throughout the year and that he had "... often met with it in the depth of winter." He also mentioned that "...it is more frequently observed on the lower surfaces of objects resting partially on the ground.", and white (unpigmented) specimens have been taken from leaf litter samples, which suggests that larvae pupate in this medium.

In New Zealand, most species of farm trees, orchard trees, ornamental trees, ornamental shrubs, crop plants, flower plants, vegetable plants and weeds are introduced and a large number of aphid species has also been introduced. *Micromus tasmaniae* is a well-known predator of aphids in Australia and New Zealand, and with such a large food supply on such a wide range of plants it is the most common lacewing in both countries.

Broun's (1898) record of *Chrysopa* as being common probably referred to *M. tasmaniae* and this species has been recorded since as a predator of pest species by Myers (1921), Gourlay (1930), Clark (1932) on introduced Adelgidae, Miller & Clark (1935), Carter (1949) on Triozidae (Psylloidea), Cumber & Eyles (1961), Valentine (1964, 1967) and Farrell & Stufkens (1988, 1990). The species was also the subject of a university thesis by Hilson (1964), and another university study by Syrett (including physiology, Syrett & Penman 1981)



Fig. 29. Map of New Zealand with localities of *Micromys bifasciatus* Tillyard, 1923 and *Micromys tasmaniae* "varieties", and overall distribution of *Micromys tasmaniae* (Walker, 1860).

and is included in general works such as *New Zealand pest and beneficial insects* (Scott 1984) and Cameron *et al.* (1989) on biological control.

Gourlay (1964) recorded that *M. tasmaniae* is parasitised by *Anacharis zealandica* Ashmead, "... parasitism occurs after the larva ... spins the cocoon".

COMPARISON OF *MICROMUS BIFASCIATUS* AND *M. TASMANIAE*

The two species are similar in most characters. The wing venation and genitalia of males and females are of the same pattern. There is a slight difference in wing shape, that of *M. bifasciatus* being more slender. The dorsum of the head shows a distinct specific difference both in tuberculation and colour pattern. The colour pattern of the anterior wings is also specifically different, *M. bifasciatus* has two obvious brown transverse bands and a brown streak between close medial and cubital veins while *M. tasmaniae* has a spotted appearance including a brown spot between the close medial and cubital veins. While the male genitalia need to be further examined, the shape of the ectoproct, arcessus, parameres and Sternite IX are of the same pattern; Sternite IX shows some differences in shape and the parameres show a tangible specific difference in the shape of the dorsal process. The female genitalia are very close in pattern; perhaps the only specific difference being in the shape of the sub-apical chamber of the spermatheca.

MICROMUS TASMANIAE VARIETIES OR *M. BIFASCIATUS* X *M. TASMANIAE*?

Individuals of *Micromus tasmaniae* are usually very uniform, with spotted wings, with the darkness or extent of the transverse lines on the gradate cross-veins being the only variation easily seen. The author knows of no varieties, such as those described by Tillyard from New Zealand specimens, that have been recorded among Australian specimens. There seems to be another influence in New Zealand, perhaps the presence of *M. bifasciatus*, a very closely related species. Both the named varieties of *M. tasmaniae* are based on specimens with some characters tending to those of *M. bifasciatus* and it is possible that these specimens, particularly those of the outstanding *nigroscriptus* form, are hybrids of the two species.

An extreme view would be to consider the *tasmaniae* 'varieties' as intermediates linking *tasmaniae* and *bifasciatus* as one species, but this view is not accepted here on account of the distinct and constant wing, head and prothorax markings, slight genitalic differences, the different groups of insects preyed upon and the different countries of origin.

DISCUSSION

Although both species occur through the length of both North and South Islands, they are probably separated by their food requirements. As noted above, *M. bifasciatus* is associated with endemic podocarp forest trees, which are host plants for endemic Coccoidea, and *M. tasmaniae* with a large array of plants, in open and cultivated areas, which are host plants for Aphidoidea.

An interesting result has come from some Forest Research Institute collecting in a marginal area of the Pureora State Forest Park, Waipapa Reserve, north-west of Lake Taupo.

Malaise traps were set in shrubland and c. 200 m inside Podocarp forest (including rimu), almost a kilometre apart and out of sight of each other. Between 1 December 1983 and 29 March 1984 *M. tasmaniae* specimens were taken from the shrubland trap on 12 days while, from the forest trap one *M. bifasciatus* was taken in February and one *M. tasmaniae* in March. Although small numbers, these records are consistent with the suggestion that *M. bifasciatus* is associated with areas of native trees and *M. tasmaniae* mainly with open vegetation. Similarly, on Stewart I, *M. bifasciatus* occurs in endemic forest and the one known occurrence of *M. tasmaniae* is from the only settlement, where there are gardens.

Nakahara (1960) placed *M. tasmaniae* in a separate genus (since synonymised with *Micromus*), on the basis of genitalic characters, and New (1988) commented that this species "is very distinct on its 'speckled' wing venation and on genitalic features". Now that the form of the genitalia of *Micromus bifasciatus* and *Micromus tasmaniae* is seen to be very close, it seems that they are separate from other species of *Micromus* and can be considered sister species.

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